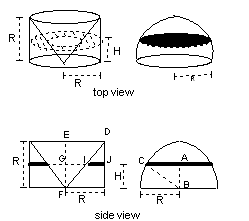
ASSIGNMENT 93 93B

7)

Finding a formula for the volume of a sphere is not trivial. Consider the three solids shown : a **cone** inscribed in a **cylinder** , and a **hemisphere (half a sphere)**.

a) If we can find a formula for the volume of a hemisphere of

radius R , what would we do to that formula to have one

for the volume of a **sphere** of radius R ?

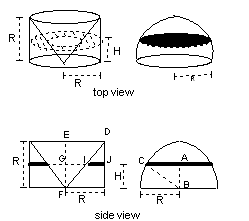
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b) Find the radius\_\_\_\_\_\_\_ , height\_\_\_\_\_\_\_\_ , and

volume\_\_\_\_\_\_\_\_\_\_\_\_\_ of the cone in the sketch.

c) Find the radius\_\_\_\_\_\_\_\_ , height\_\_\_\_\_\_\_\_ ,

and volume\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the cylinder in the sketch.



d) The dotted cross-section in the cylinder is called an

**annulus** - its area is clearly just the difference of the

areas of the larger and smaller circles forming it. We are

going to show that, **for any and every possible H value,**

the area of the annulus cross-section in the cylinder is

equal to the area of the circular cross section in the

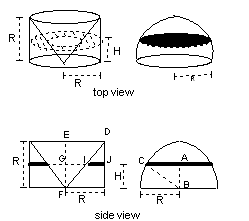
hemisphere. When we succeed, what conclusion can we

draw relating the **volumes** of the hemisphere, cylinder

and cone?

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 e) Now, to accomplish our goal of showing the annulus and circles have equal area. Look at the “side view " of the cross-section of the hemisphere:

i) Find an expression for the lengths BC\_\_\_\_\_\_\_\_\_\_ and AB\_\_\_\_\_\_\_\_\_\_\_\_\_.

ii) Use the Pythagorean theorem to find an expression for

the length AC \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

iii) Find the area of the circular cross-section in the hemisphere \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

f) Look at the "side view " of the cross-section of the cylinder:

i) Find an expression for the lengths GJ\_\_\_\_\_,ED\_\_\_\_\_\_, EF\_\_\_\_\_\_ and GF\_\_\_\_\_\_\_.

ii) Use similar triangles to find an expression for the length GI\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

iii) Find the area of the annulus cross-section in the cylinder by subtracting the area of the larger

circle ( radius GJ ) and the smaller circle ( radius GI ).

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

g) Is your expression for the area of the annulus cross-section equal to your expression for the area of

the circular cross-section in the hemisphere? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

h) Now, use your answers to parts "a" -"d" to find a formula for the volume of a sphere with radius R.

VOLUME = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_